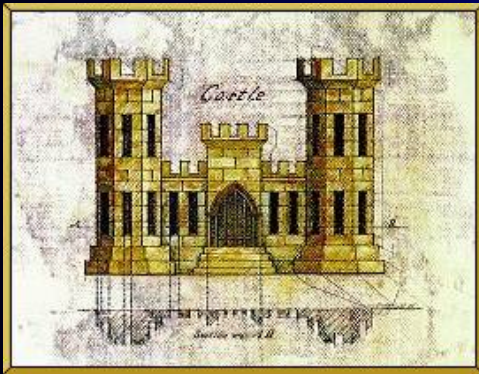
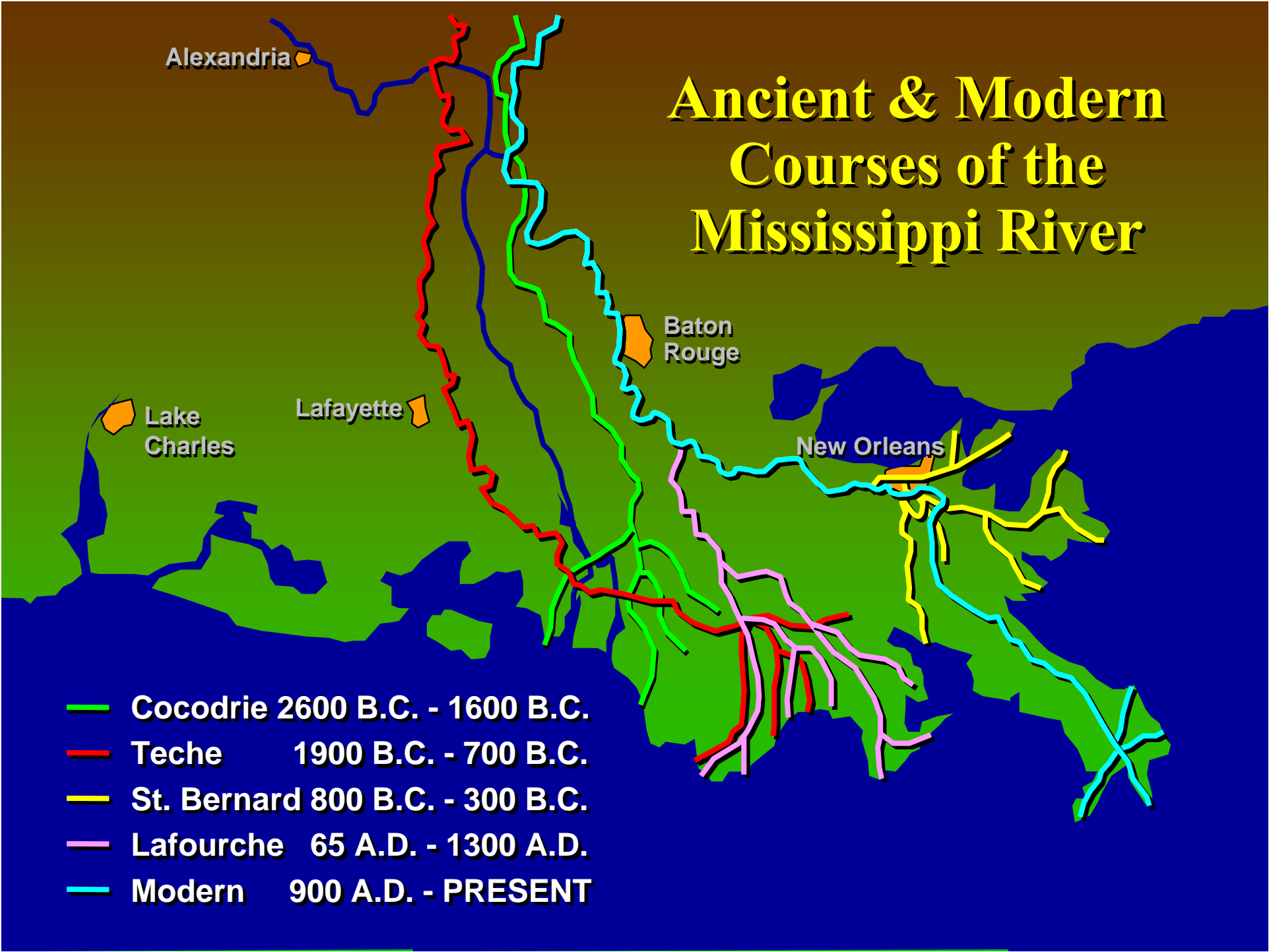


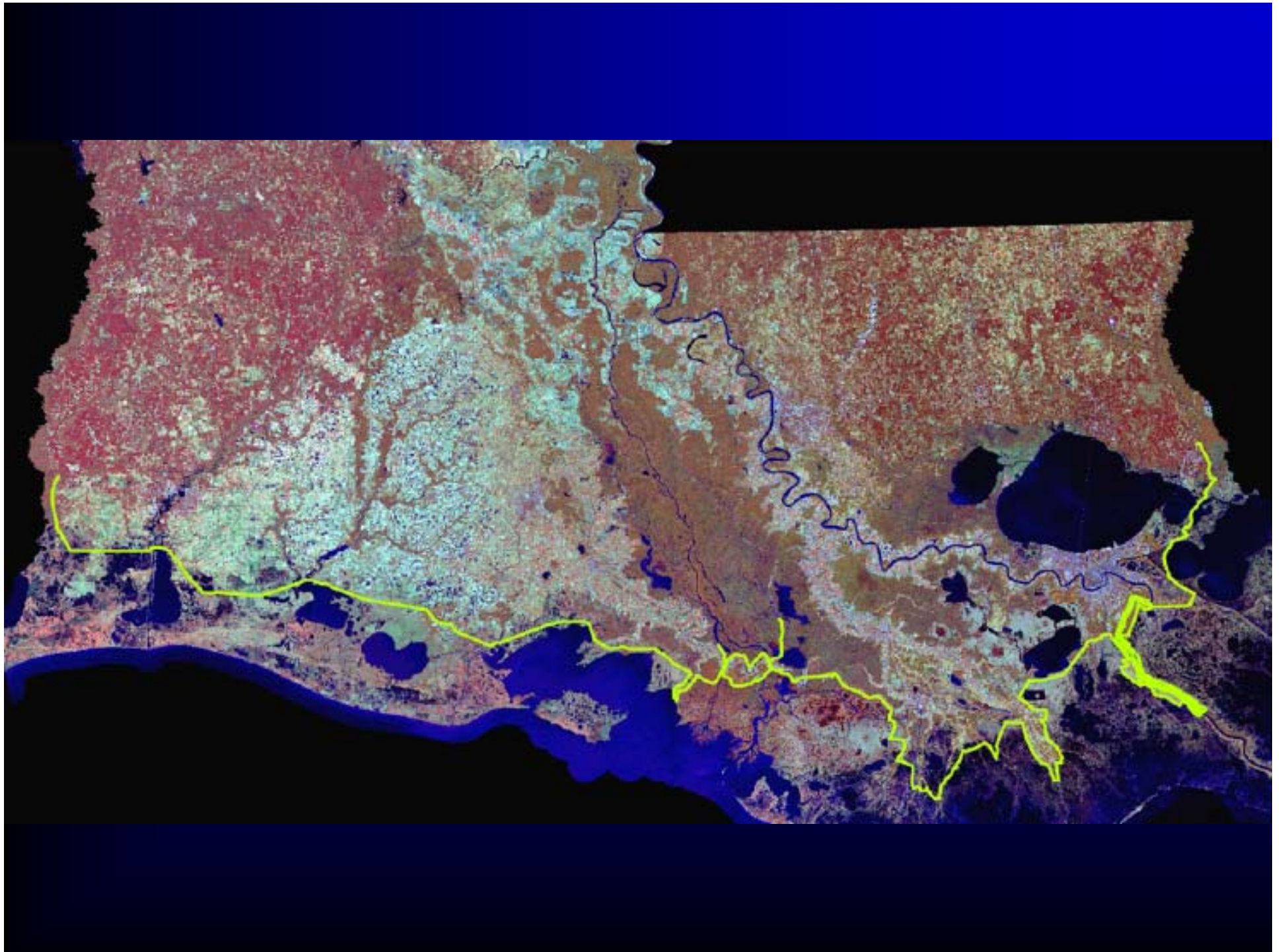
GEOTECHNICAL DESIGN IN COASTAL LOUISIANA

- Pete Cali



Ancient & Modern Courses of the Mississippi River

- 
- The map illustrates the historical and modern courses of the Mississippi River. The background is a gradient from brown at the top to blue at the bottom, representing the Gulf of Mexico. The river's courses are shown as colored lines: green for the Cocodrie course (2600 B.C. - 1600 B.C.), red for the Teche course (1900 B.C. - 700 B.C.), yellow for the St. Bernard course (800 B.C. - 300 B.C.), pink for the Lafourche course (65 A.D. - 1300 A.D.), and cyan for the modern course (900 A.D. - present). Key locations are marked with orange squares: Alexandria at the top left, Lake Charles on the left, Lafayette in the center-left, Baton Rouge in the center-right, and New Orleans on the right. The modern course (cyan) is the most prominent, flowing from the top right down to the Gulf of Mexico. The other courses are shown as branches or earlier paths of the river.
- Cocodrie 2600 B.C. - 1600 B.C.
 - Teche 1900 B.C. - 700 B.C.
 - St. Bernard 800 B.C. - 300 B.C.
 - Lafourche 65 A.D. - 1300 A.D.
 - Modern 900 A.D. - PRESENT

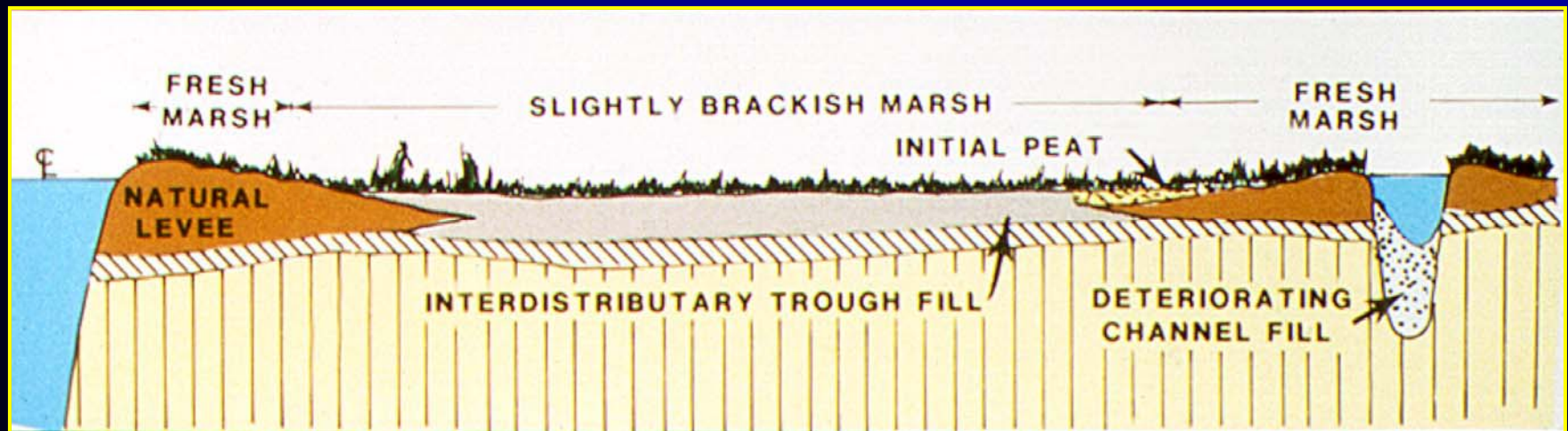




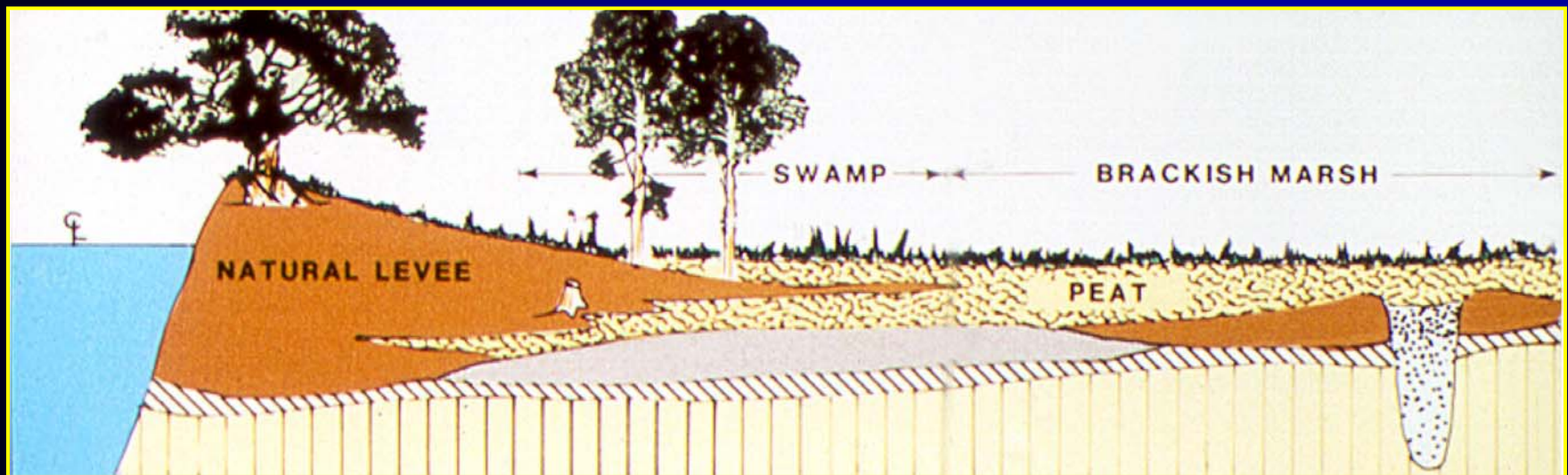
Initial Development of Distributaries and Interdistributary Trough



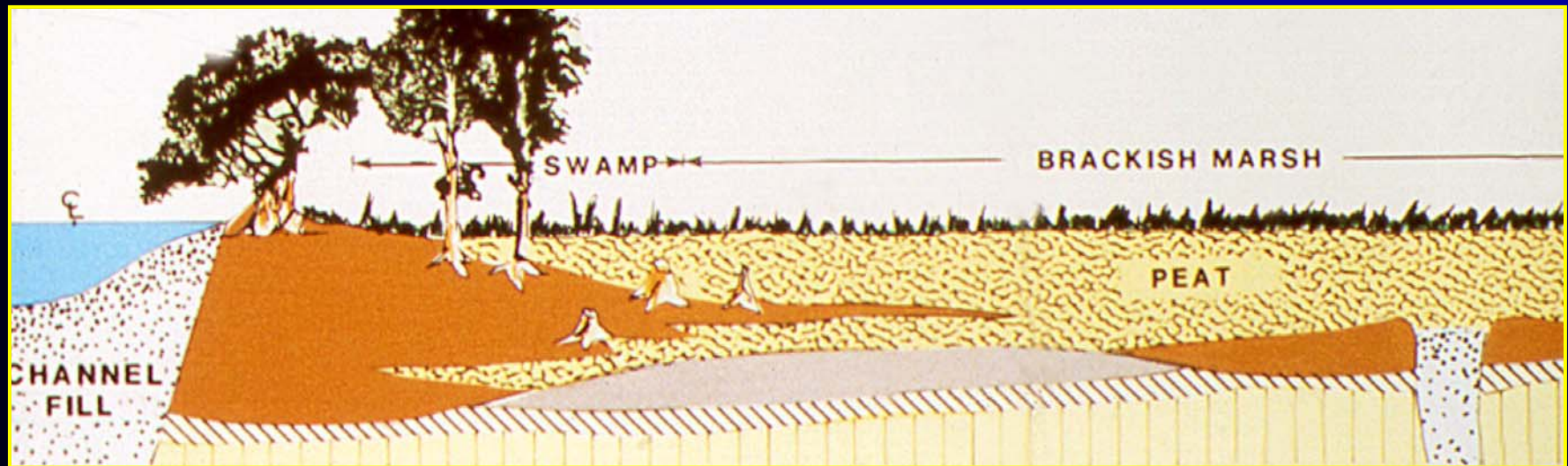
Enlargement of Principal Distributary and its Natural Levees – Creation of Marshes in Trough



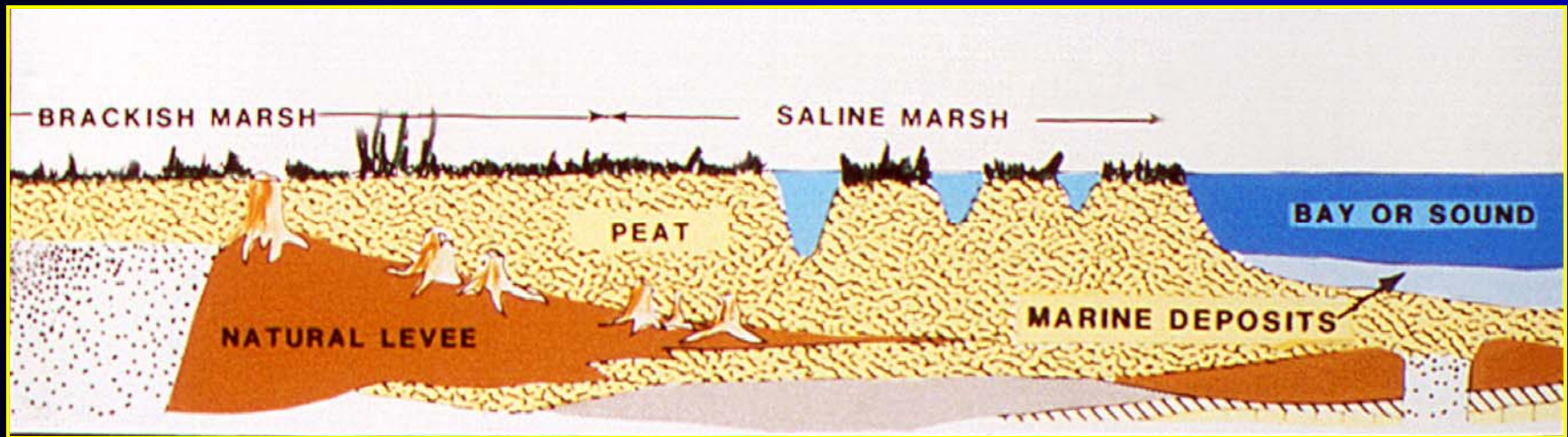
Maximum Development of Distributary and its Natural Levees – Creation of Swamp as Levee Subsides



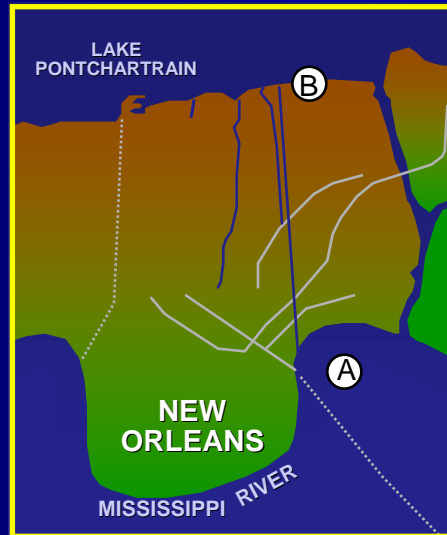
Deterioration of Distributary – Advance of Swamp Over Subsiding Levees



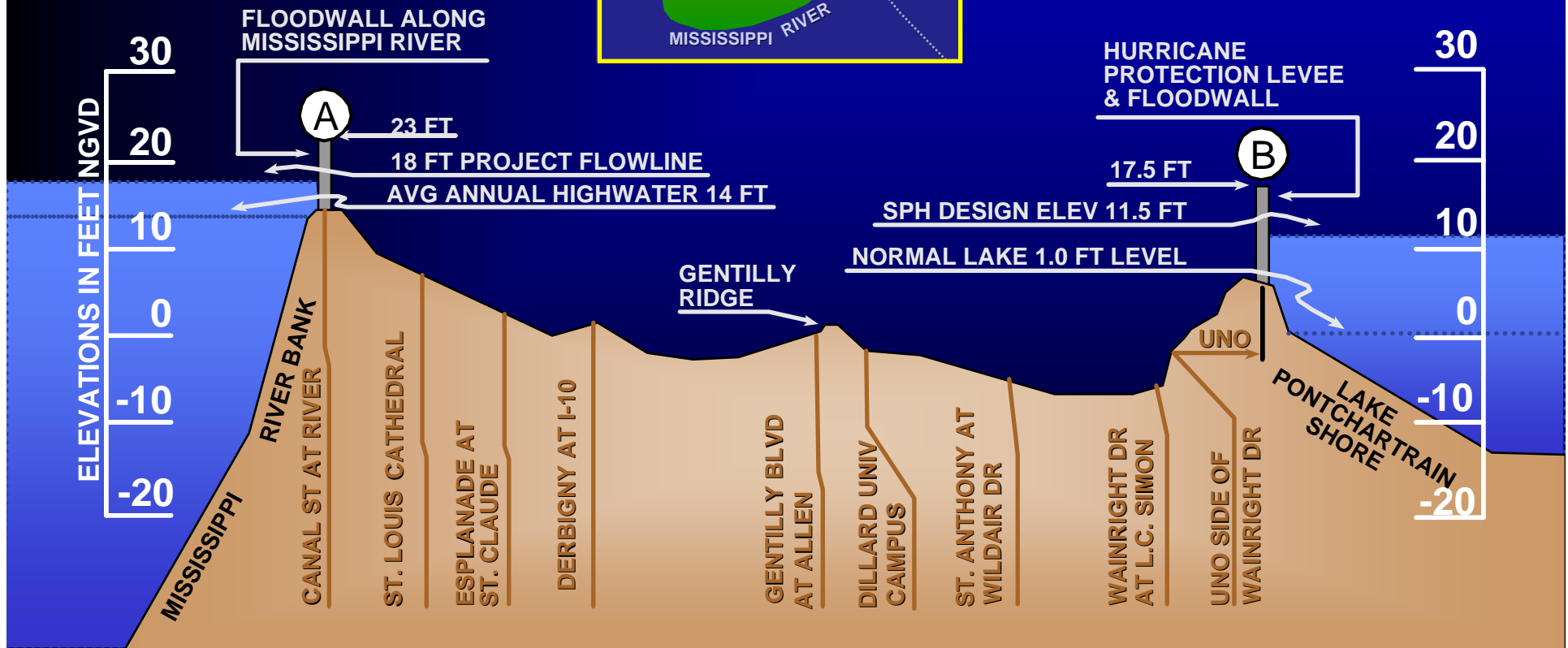
Continued Subsidence with Partial Destruction of Marshes



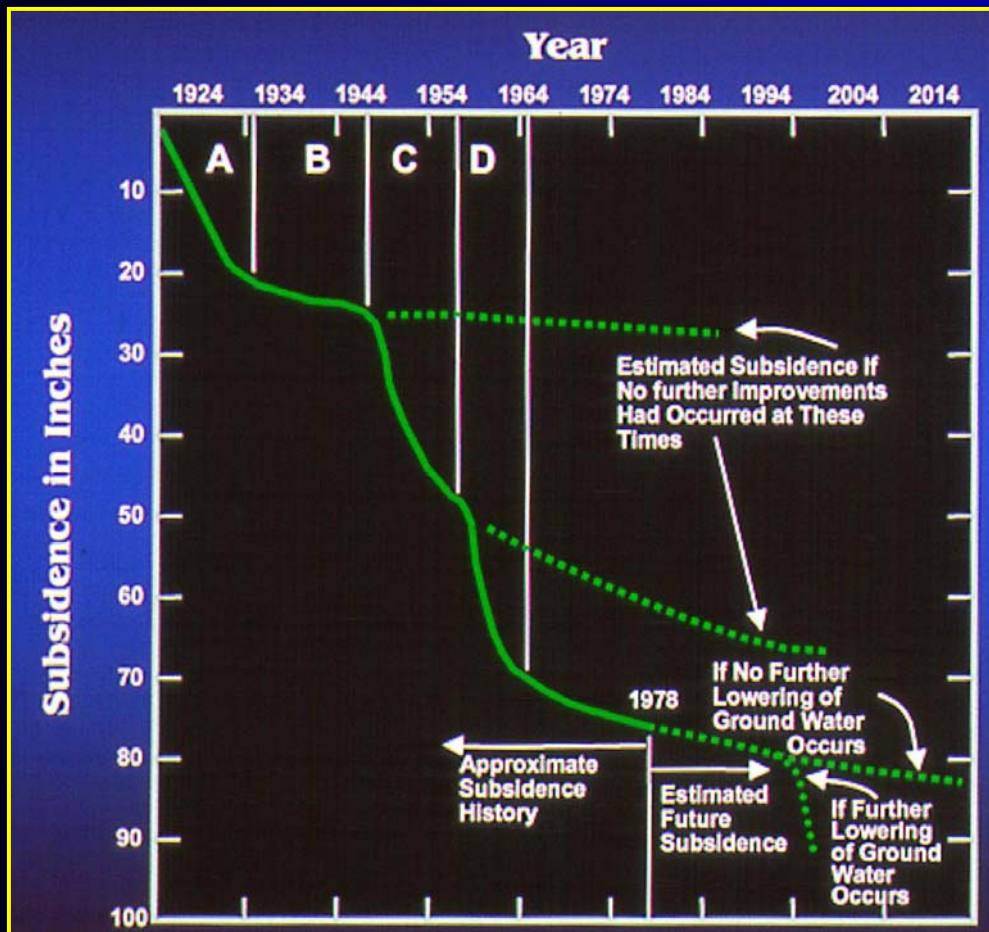
City of New Orleans Ground Elevations



From Canal St. at
Mississippi River
to the
Lakefront at U.N.O.



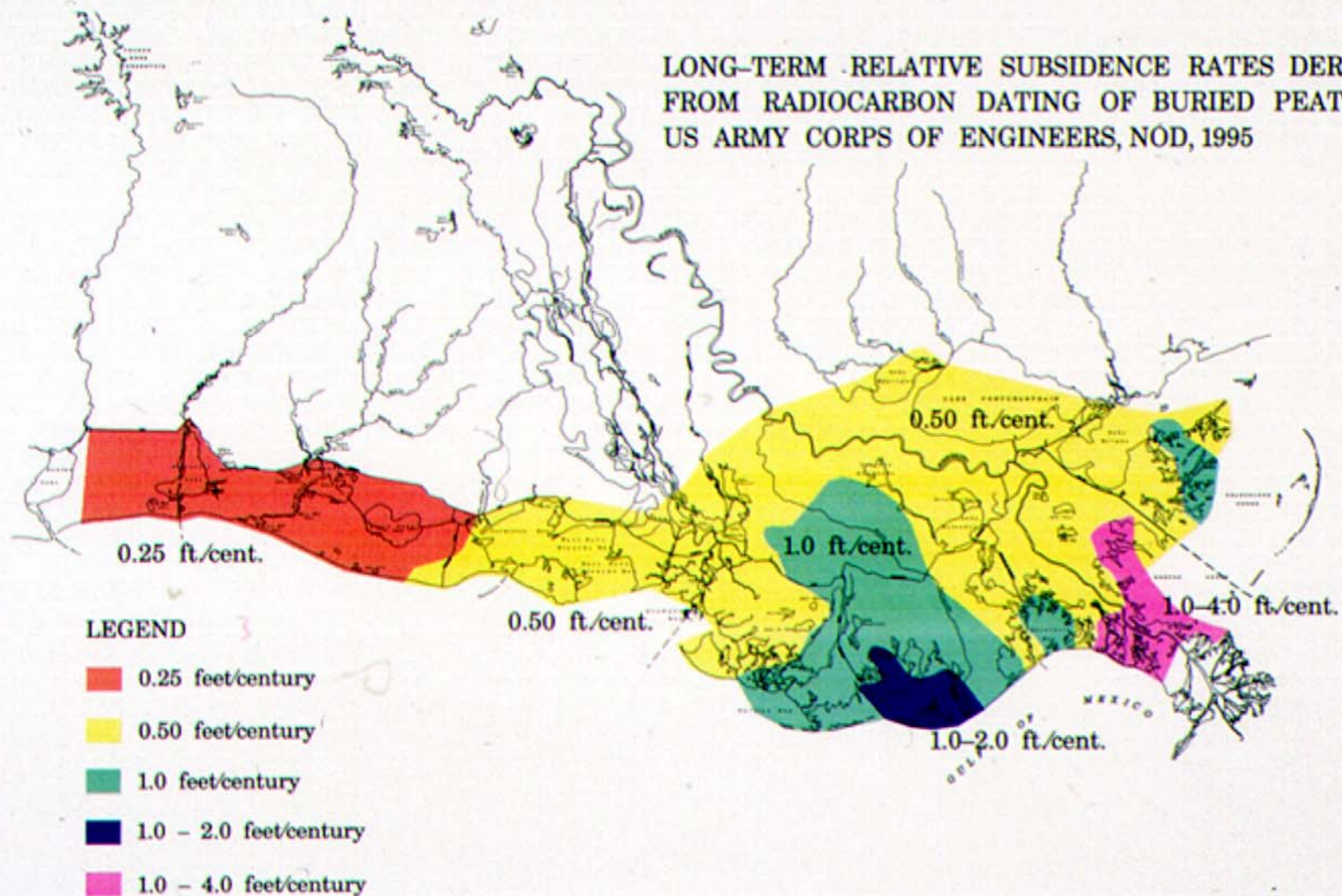
Settlement



- A Initial Pumping
- B Minimal Uniform Pumping
- C Improved Surface Drainage and Levee Protection
- D Increased Development and Subsurface Drainage

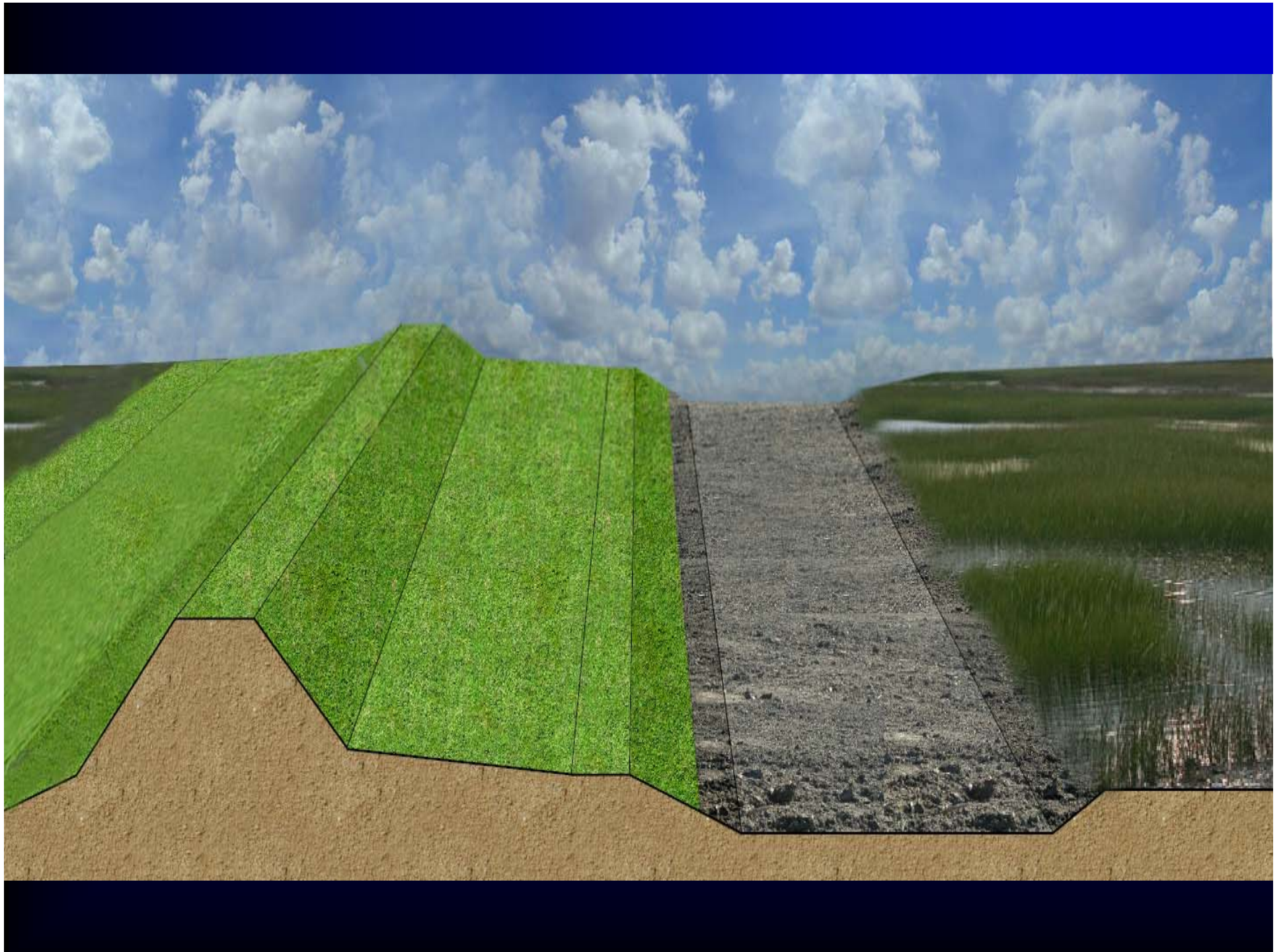
Approximate subsidence history and estimated future subsidence for area in Kenner, Louisiana, north of Interstate 10 (Normalized for peat thickness of 8 feet).

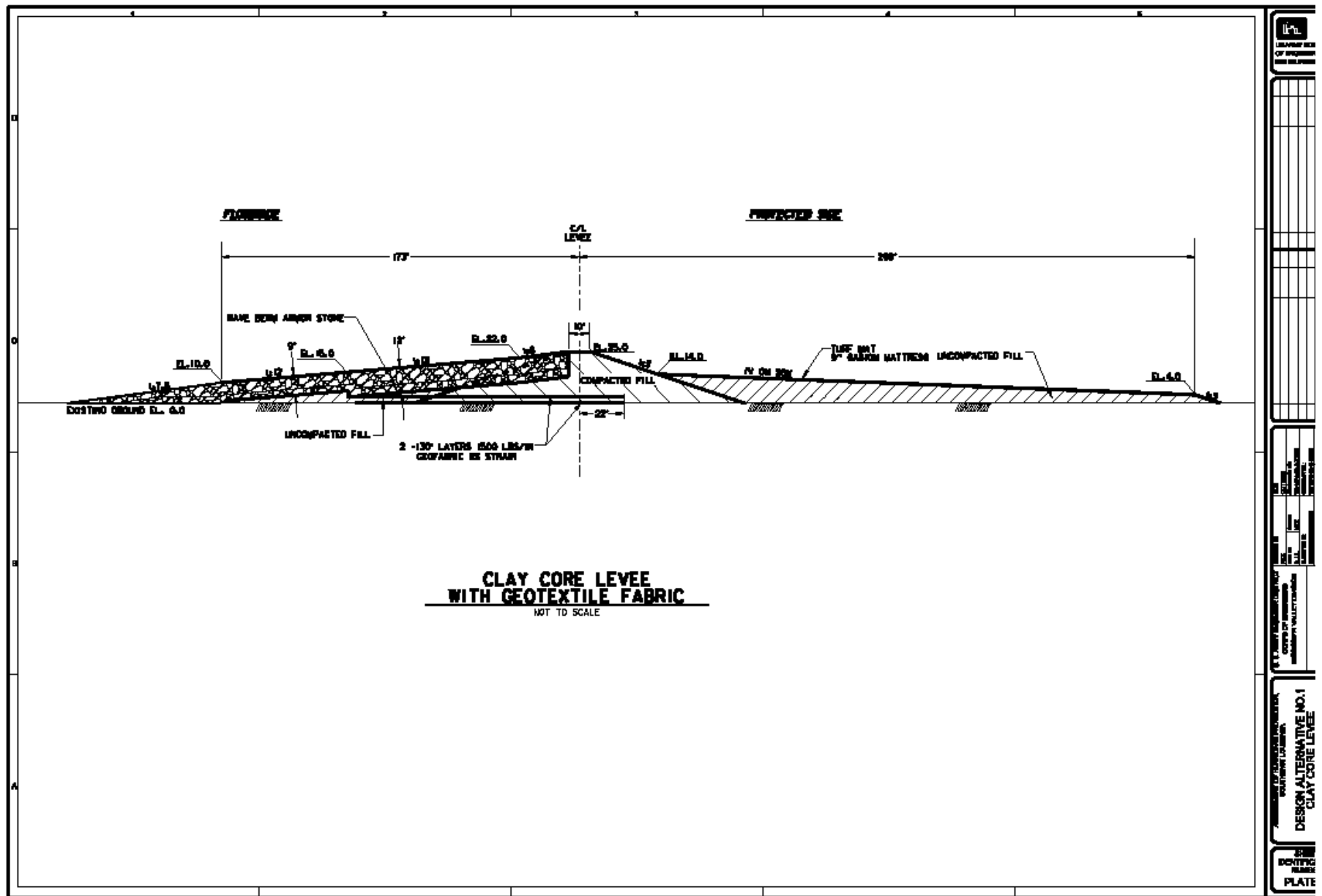
LONG-TERM RELATIVE SUBSIDENCE RATES DERIVED
FROM RADIOCARBON DATING OF BURIED PEAT DEPOSITS,
US ARMY CORPS OF ENGINEERS, NOD, 1995



DESIGN CONSIDERATIONS EARTHEN STRUCTURES

- **SLOPE STABILITY**
- **UNDERSEEPAGE**
- **SETTLEMENT**
- **SUBSIDENCE**
- **FOUNDATION STRENGTH GAIN**
- **SUITABLE MATERIAL AVAILABILITY**
- **ACCESS AND HAUL ROADS**
- **CONSTRUCTION UNDER WATER**



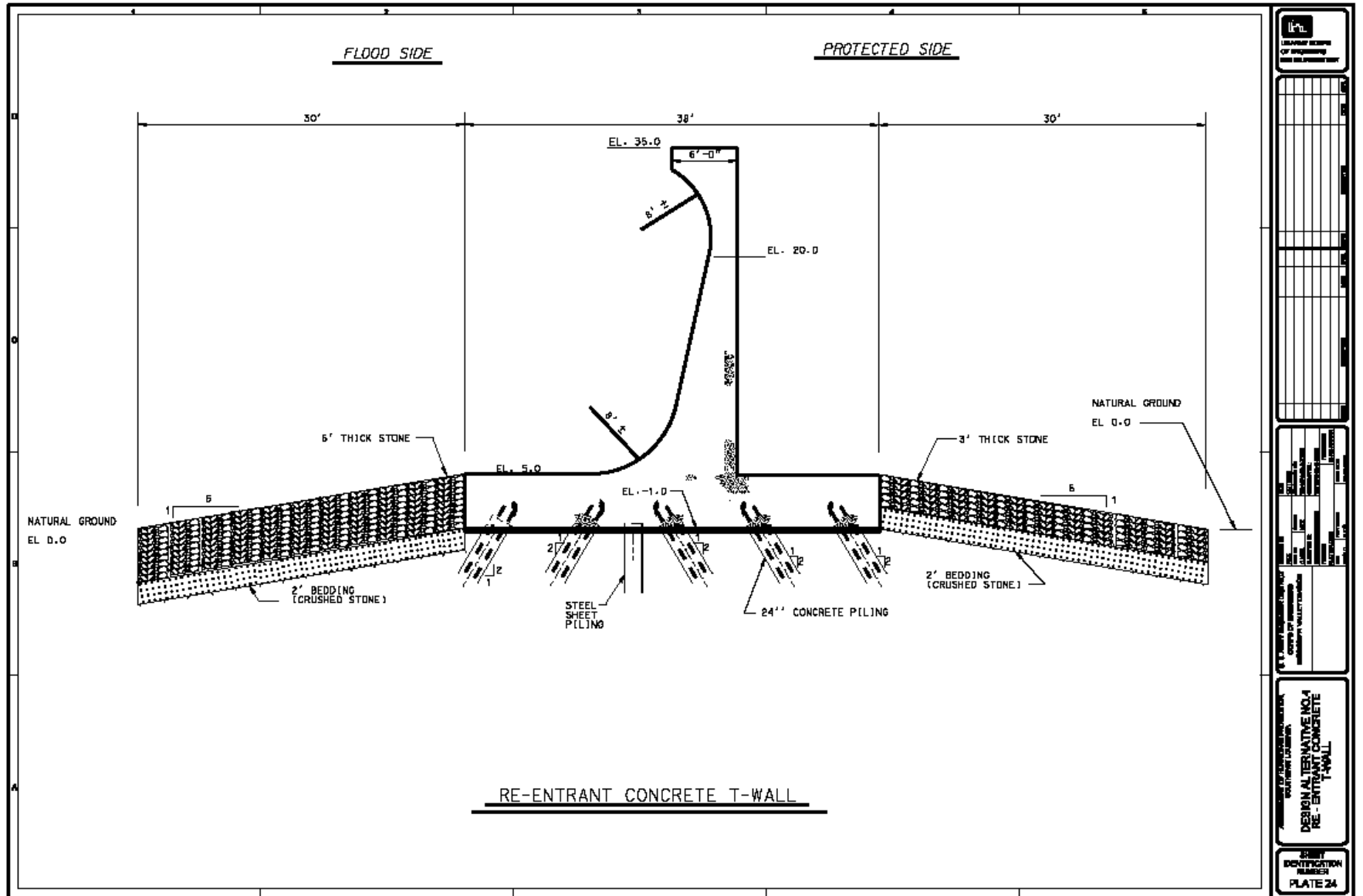


DESIGN CONSIDERATIONS ROCK DIKES AND BREAKWATERS

- **STABILITY**
- **SETTLEMENT**
- **ROCK AVAILABILITY**
- **ACCESS**
- **FLOTATION CHANNELS**

DESIGN CONSIDERATIONS STRUCTURES

- **PILE CAPACITY**
- **SHEET PILES**
- **SETTLEMENT**
- **NEGATIVE SKIN FRICTION**
- **UNDERSEEPAGE CUTOFF**
- **SLIDING STABILITY**
- **TRANSITION TO EMBANKMENT**
- **ACCESS**



Pleistocene Horizon Vicinity of New Orleans

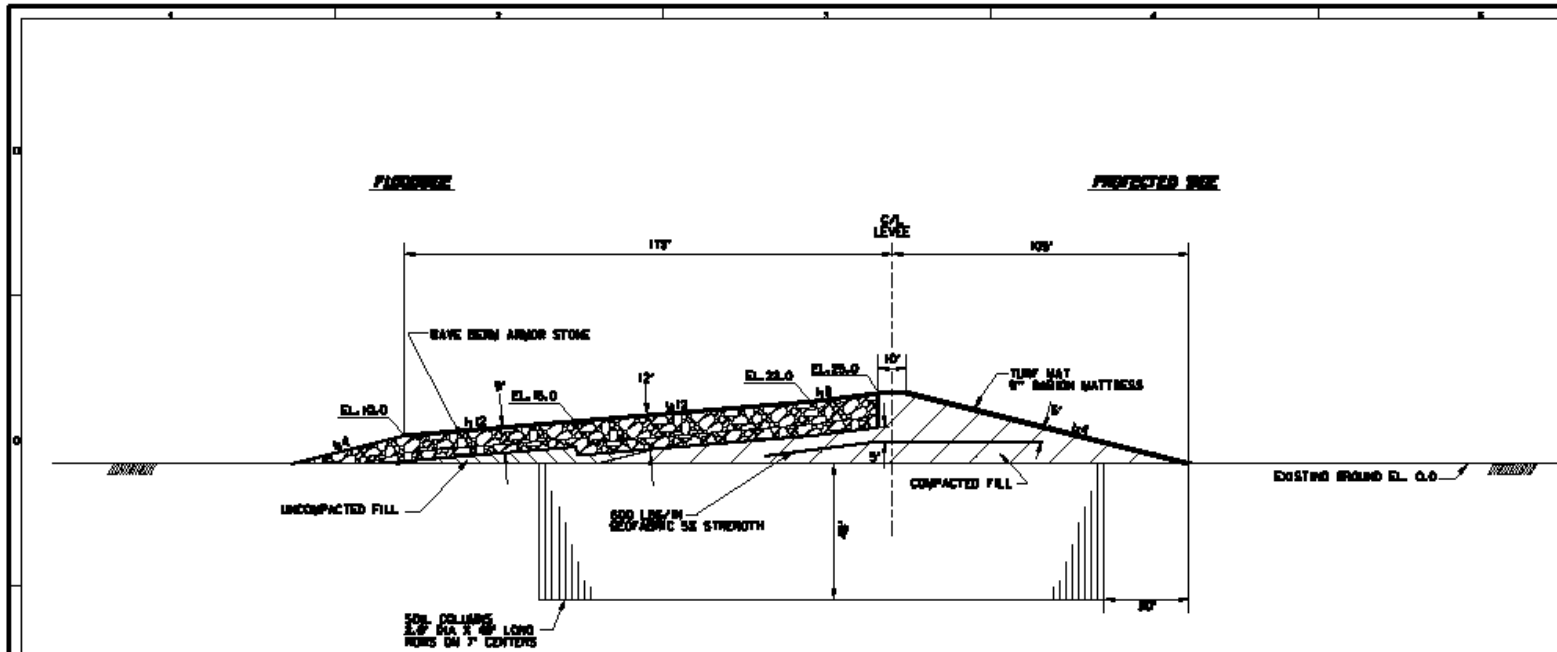


GEOTECHNICAL DESIGN TOOLS

- **EARTH (CONVENTIONAL COMPACTION)**
- **GEOTEXTILES**
- **STEEL SHEET PILES**
- **FRICTION PILES**
- **EXCAVATE AND REPLACE**

NEW DESIGN TOOLS

- **SLURRY WALLS**
- **DEEP SOIL MIXING**
- **MASS STABILIZATION**
- **ROLLER COMPACTED CONCRETE**
- **INTERNAL MECHANICAL
STABILIZATION**
- **STONE COLUMNS**



**SOIL-CEMENT FOUNDED LEVEE
WITH CLAY CORE**
NOT TO SCALE

PROJECT NAME PROJECT NUMBER PROJECT LOCATION PROJECT DESCRIPTION PROJECT STATUS PROJECT DATE	
PROJECT ENGINEER PROJECT CHECKER PROJECT APPROVER PROJECT REVIEWER PROJECT DATE	
PROJECT IDENTIFICATION PROJECT NUMBER PROJECT DATE	

OTHER CONSTRUCTION CONSIDERATIONS

- **DAMAGE TO PUBLIC ROADS AND
HIGHWAYS**
- **FLOTATION CHANNELS**
- **RELOCATIONS**
- **DRAINAGE**
- **ENVIRONMENTAL**











Questions

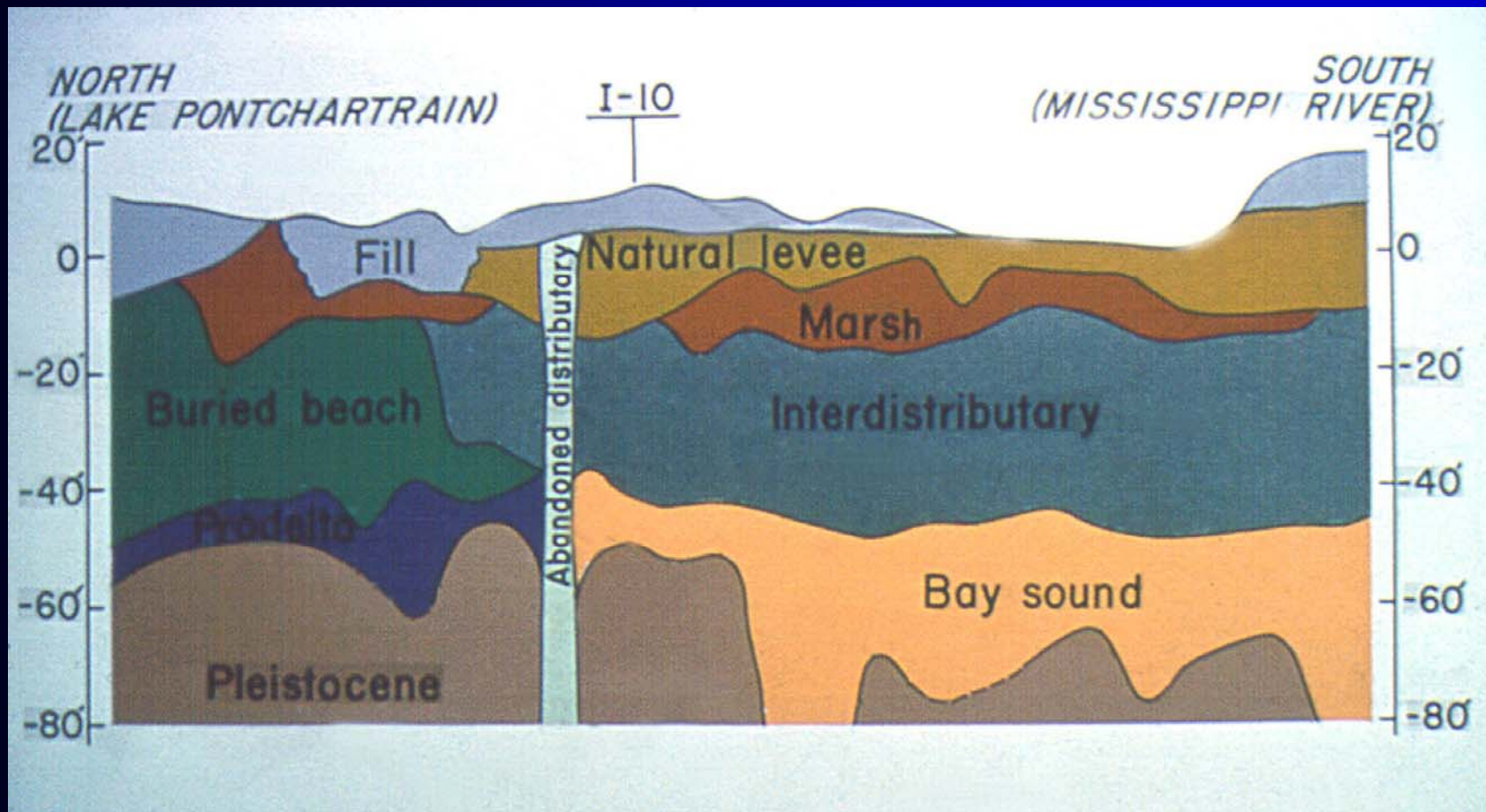
Peter R. Cali, Ph.D., P.E.

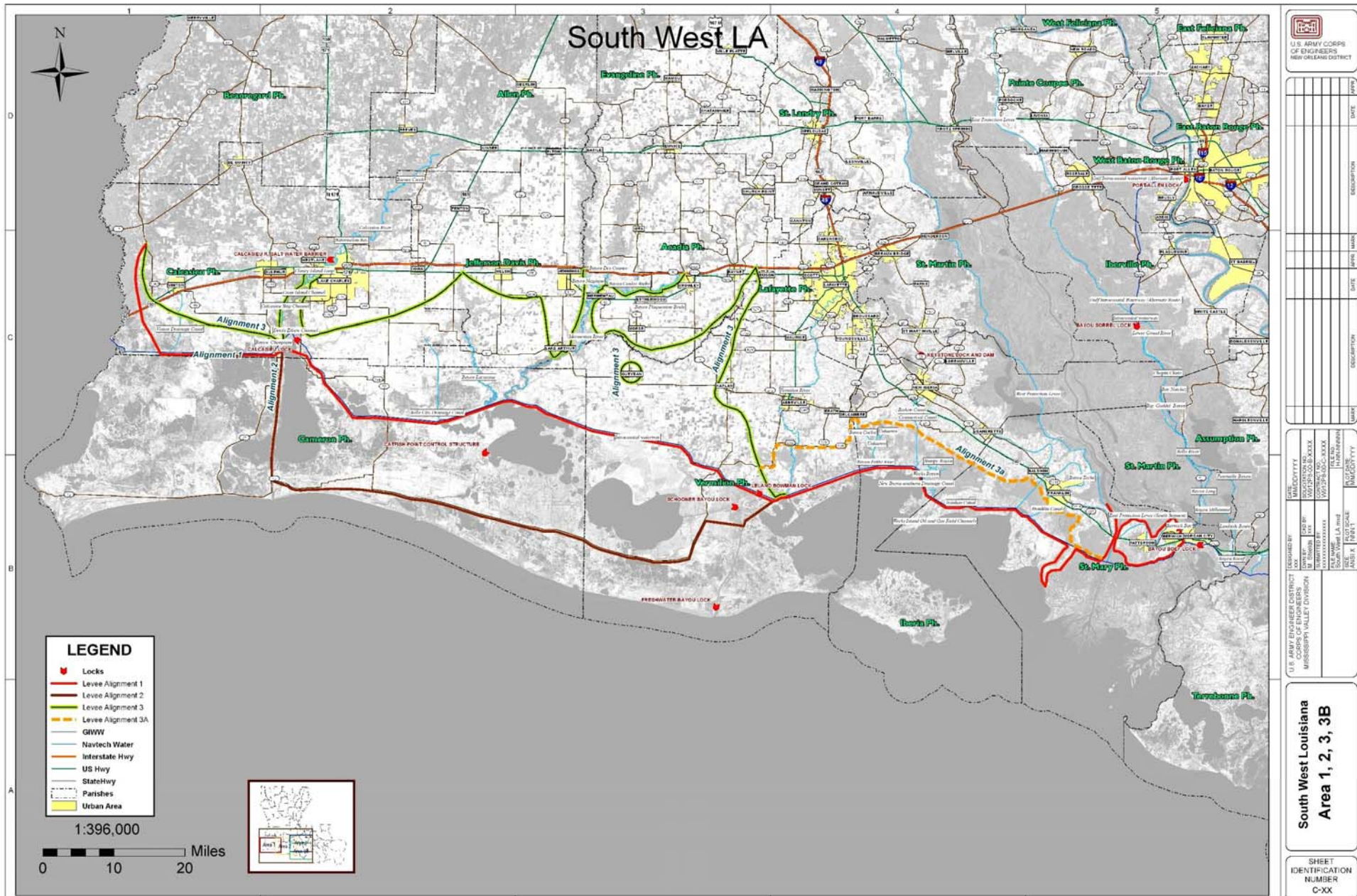
Task Force Guardian

Engineering and Design

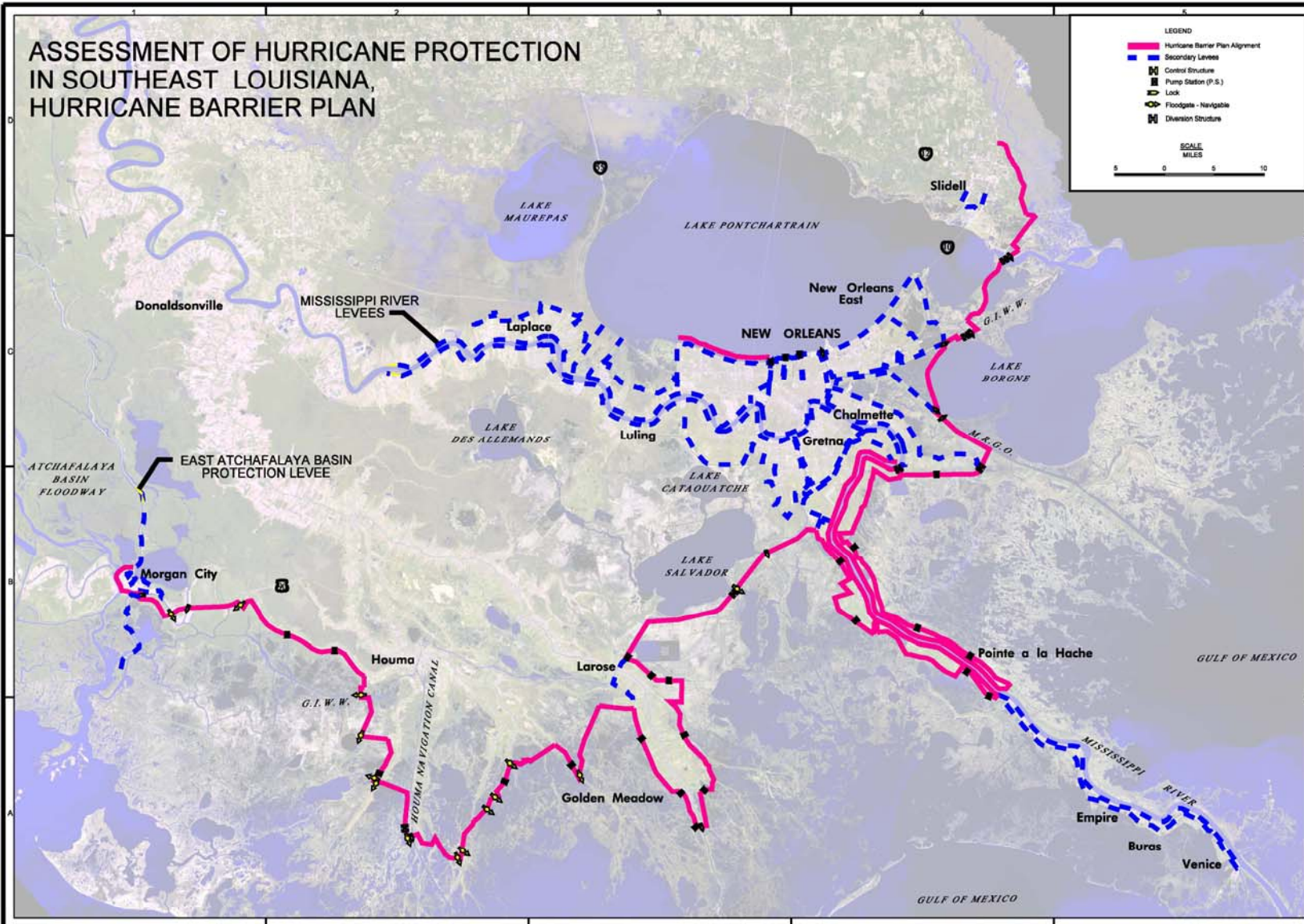
Phone (504) 862-1001

E-mail: peter.r.cali@mvn02.usace.army.mil





ASSESSMENT OF HURRICANE PROTECTION IN SOUTHEAST LOUISIANA, HURRICANE BARRIER PLAN



US ARMY CORPS
OF ENGINEERS
NEW ORLEANS DISTRICT

[illegible][illegible]

HURRICANE BARRIER PLAN

SHEET
IDENTIFICATION
NUMBER
PLATE 20

Generalized Stratigraphy

Soil Properties

Ground surface El. 0

Peat, $\gamma = 90$ pcf, $c = 150$ psf, $w = 200\%$,

Swamp: $\gamma = 100$ pcf, $c = 260$ psf, $w = 80\%$

Organics: $\gamma = 98$ pcf, $c = 400$ psf, $w = 160\%$

Silt, $\gamma = 117$ pcf, $c = 200$ psf, $\phi = 15^\circ$, $w = 25\%$

Interdistributary clay: $\gamma = 102$ pcf, $c = 400-800$ psf,
 $w = 40$ to 60% , $PL = 20$, $LL = 70$, $LI = 0.7$

-52

Buried Beach Sand overlying

Pleistocene Clay: $\gamma = 115$ pcf, $c > 1,000$ psf